

Preliminary report on Ordovician–Silurian boundary rocks in the Interlake area, Manitoba, Canada

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Synopsis

Both Ashgill and early Llandovery rocks are represented in both surface outcrop (Stonewall Quarry) and the subsurface of Manitoba, but there is no definite evidence of continuous sedimentation through the boundary period.

The Interlake area of central Manitoba and its northwestward extension to eastern Saskatchewan (Fig. 1) provides the only outcrop area for the Lower Palaeozoic strata of the Williston Basin, and the only Lower Palaeozoic outcrops between Hudson Bay and the western Cordillera. Unfortunately, outcrops are sparse and expose only limited stratigraphical intervals, so that it is not possible at present to propose a definitive locality for the Ordovician–Silurian boundary there. No single outcrop area is at present known which exposes completely the required stratigraphical interval. Nevertheless, because of the critical location of the Manitoba outcrop belt, the following will present a brief summary of data relevant to the delineation of the boundary.

Stearn (1953, 1956), on the basis of detailed faunal studies, placed the Stonewall Formation in the Ordovician and placed the Ordovician–Silurian boundary at the contact between the Stonewall Formation and the overlying Fisher Branch dolomite of the Silurian Interlake Group. However, because of erosion of the uppermost beds, the type section of the Stonewall Formation at the Stonewall Quarry is incomplete. At the time of Stearn's studies, firm correlation with the complete subsurface sequence had not been established. Subsequently, Porter & Fuller (1959) established a subsurface reference section for the Stonewall Formation, based on correlation of regional marker horizons (B. A. Morriveau, 8-20-90-6W; 875'–920'). Detailed correlations between the Morriveau well and the Stonewall Quarry (about 72 km to the east) indicate that, at the Stonewall Quarry, the uppermost 4 to 6 m of the Stonewall beds, including a prominent medial arenaceous-argillaceous marker bed (t-horizon) has been eroded. Brindle (1960), from subsurface faunal studies, suggested that the Ordovician–Silurian boundary falls within the Stonewall Formation, rather than at the top, and may be marked by the medial arenaceous bed. It must be noted that marker beds at the top, middle and bottom of the Stonewall Formation can be correlated through almost the entire Williston Basin, indicating little or no stratigraphical discontinuity at the Ordovician–Silurian boundary.

Preliminary results of conodont studies (C. R. Barnes, personal communication) indicate an Ordovician–Richmondian (Ashgill) age for the Stonewall Quarry beds. Also, a possible late Lower Llandovery fauna was obtained from a core hole drilled near the outcrop belt north of Grand Rapids. Exact correlation of this core hole with the surface section is uncertain, but it appears that the sampled interval may be upper Stonewall, and the upper Stonewall beds may, at least in part, fill the apparent gap between the lower Stonewall beds of Ashgill age and the Middle Llandovery Fisher Branch beds.

Recent stratigraphical core hole drilling in the Interlake outcrop belt, and mineral exploration drilling in the area north and west of Grand Rapids, have obtained a number of cores for the Fisher Branch–Stonewall–Stony Mountain succession, so that the complete lithological sequence through the Ordovician–Silurian boundary interval is now available. Also, recent geological mapping has outlined several new outcrops that may expose this interval. Although no systemic boundary outcrop can be defined with certainty, two newly accessible occurrences may possibly include the boundary zone, but precise faunal data for these outcrops are not yet

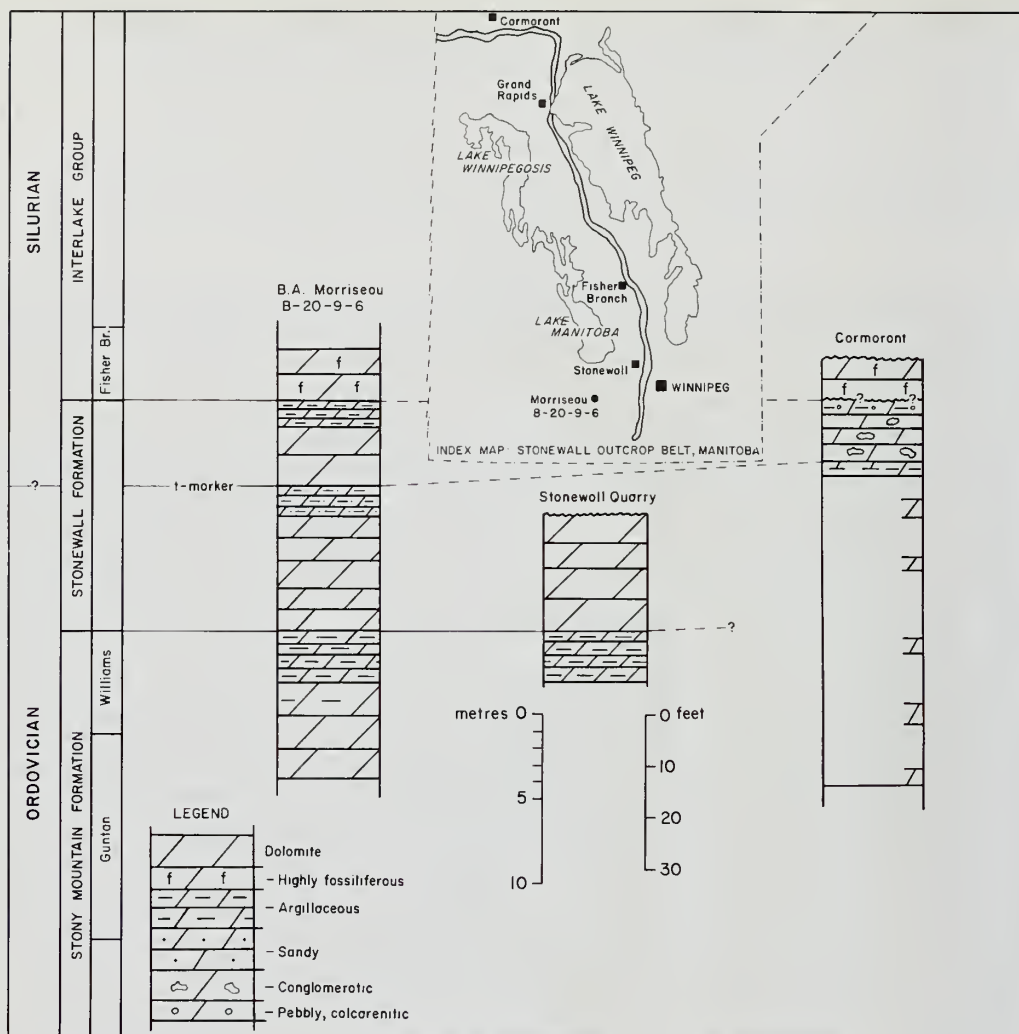


Fig. 1 Correlation of the Stonewall Formation and adjacent rocks in the Interlake area, Manitoba, Canada (in part after Porter & Fuller 1959). Correlation with the subsurface is also shown.

available. A thin sequence of dolomites, including an argillaceous marker bed believed to be the mid-Stonewall (t-horizon) marker, is exposed at the parking lot for the Manitoba Hydro powerhouse at Grand Rapids, but the remaining stratigraphical exposure is minimal.

A large bedrock hill south of the village of Cormorant (approx. Sec. 14, Tp. 60, Rge. 22 WPM), on the south shore of Cormorant Lake, is traversed by a recent extension of Provincial Road 287. This hill is believed to comprise an outlier of the Stonewall Formation, although exposure is by no means complete (Fig. 1). Good exposures occur in a roadcut at the top of the hill, in a small quarry near the top, and in a number of scattered natural outcrops on the slopes of the hill. Total topographic relief (partially exposed stratigraphical section) is 33 m, and the estimated Stonewall thickness is only about 10.6 m. A preliminary examination shows, at the top of the hill, a 2–3 m cap of massive to nodular bedded, buff mottled, variably fossiliferous dolomite with numerous corals and minor brachiopods and gastropods, but no recognizable

Virgiana decussata (the diagnostic fossil of the Fisher Branch Formation). These beds have not yet been identified palaeontologically, but on the basis of lithology are believed to be Fisher Branch Formation (Middle Llandovery). These beds overlies sharply, and with apparent slight unconformity, a pebbly argillaceous marker bed (0.9 m), which in turn is underlain by fine-grained dense conglomeratic dolomite (2.87 m). This in turn overlies a 0.64 m reddish grey dolomitic shale and argillaceous dolomite (possible t-marker?) which passes downward to microcrystalline dense dolomites. The conglomeratic beds are believed to be stratigraphically equivalent to similar dolomites described by Stearn for an outcrop on P.T.H. 10 near Rocky Lake, 26.7 miles (42.6 km) north of The Pas (Stearn 1956: 13). Stearn reported an Ordovician fauna from these strata, suggesting that, at this locality and at Cormorant, a portion of the Upper Stonewall may be missing because of non-deposition or pre-Fisher Branch (Middle Llandovery) erosion.

Core-hole drilling and microfossil studies for the Cormorant section and for the Stonewall area, planned for 1986–87, may permit more precise determination of the Ordovician–Silurian boundary in Manitoba. It should be noted that the conglomeratic beds occurring in the Stonewall Formation in central Manitoba (e.g. the Cormorant area) are not known in southern Manitoba, where the Stonewall beds are slightly thicker and possibly comprise a more complete, but not completely exposed, Ordovician–Silurian boundary sequence.

The summary faunal list for the Stonewall Formation is as follows:

Upper Stonewall fauna (after Brindle 1960 for Saskatchewan subsurface):

Above t-marker: streptelasmid, *Favosites* cf. *favosus* Goldfuss, *Syringopora* sp., bryozoan.

Below t-marker: *Halysites* (*Catenipora*) *gracilis* Hall, ?*Oepikina stonewallensis* Stearn.

Spathognathus manitoulinensis (Pollock, Rexroad & Nicoll)—C. R. Barnes (pers. comm. 1975).

Lower Stonewall fauna (Stonewall Quarry section—after Stearn 1956): *Kochoceras* cf. *productum*, *Antiplectoceras shammattawaense*, *Paleofavosites capax*, *P. okulitchi*, *Tryplasma gracilis*, *Angopora manitobensis*, *Beatricea regularis*, *Megamyonia nitens*, ?*Oepikina stonewallensis*, *Ephippiorthoceras minutum*, *Metaspyroceras meridionale*, *Bickmorites insignis*.

(after C. R. Barnes 1975, pers. comm.): *Belodina profunda* (Branson & Mehl), *Rhipidognathus symmetrica discreta* Bergström & Sweet, *Panderodus staufferi* (Branson, Mehl & Branson).

References

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